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# Food makes a difference

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# Food makes

## CONTENTS

Food Made a Difference .....	3
Milk .....	3
Meat .....	4
Milk and Meat .....	4
Milk and Fruit .....	4
Meat, Milk, Fruit, and Vegetables .....	4
An Adequate Diet .....	4
Breakfast .....	5
Enriched Flour and Fortified Margarine .....	5
Enriched Rice .....	5
Wise Food Selection .....	5
Use of Food .....	6
Energy Food .....	7
Materials for Growth, Repair, and Regulation .....	7
Protein .....	7
Minerals .....	9
Calcium .....	9
Iron .....	10
Iodine .....	10
Vitamins .....	11
Vitamin A .....	11
Vitamin C (Ascorbic Acid) .....	11
B Vitamins .....	12
Vitamin D .....	12
References .....	14

# a difference

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Food makes a difference in our lives! The kinds of food as well as the amount of food we eat affect our health for better or for worse. In other words "food becomes our nutrition."

Nutrition for better health can pay dividends in:

- appearance—sparkling eyes, glossy hair, a glowing complexion, and good posture
- physical well-being—active, vigorous, and vivacious
- mental health—keen, alert, and enthusiastic

Research in nutrition has taken the guess work out of selecting nutritious food for buoyant health. This publication explains the essential food nutrients and cites research findings that show why it is important to include foods in our daily meals that contain high quality proteins, essential minerals, and vitamins, as well as foods to supply energy.

## FOOD MADE A DIFFERENCE

Results of a few research studies that show how food made a difference in the health of a number of persons follow.

### Milk

Milk (1)\* made a difference in the health of a large number of school children whose daily milk consumption was tripled—8 ounces increased to 24 ounces—for a period of two to three years. Physicians who examined these children at the beginning of the study and then again after two and three years observed improvement in growth; markedly reduced were respiratory infections, enlarged tonsils, and minor illnesses. Unmeasurable changes were apparent in better school work and greater liveliness in their work and play.

In another study (2 and 3) in which a pint of milk was added to the usual meals of children in a boarding school, improvement in growth and bone development was noted.

\*See references listed on pages 14 and 15.

### **Meat**

Meat (4) made a difference in rebuilding the blood of donors to a blood bank. The blood of the donors who ate an extra serving of lean meat daily after a donation became normal at the end of two months. Without the extra serving of meat, it took three months for the blood to become normal.

### **Milk and Meat**

Marked differences in the health of two African tribes (5) have been attributed to milk and meat. Those who used milk and meat in their daily meals had better health records than did those who lived chiefly on cereals, potatoes, and beans. Those who had milk and meat were taller by several inches, weighed more by several pounds, and were ill less often.

### **Milk and Fruit**

Milk and fruit (6) added to regular meals made a difference in the health of several hundred Royal Air Force recruits. These young men had failed to pass the army physical examinations. Then, for nearly a year they were given extra milk and fruit; at the same time they had plenty of rest and exercise. When they were re-examined, 87 per cent passed the same examination they had failed a year earlier.

### **Meat, Milk, Fruit, and Vegetables**

Meat, milk, fruit, and vegetables (7 and 8) added to the poor diets of pregnant mothers made a difference in their health and that of their infants. These mothers had better general health, a shorter labor period, and more success in nursing their babies than did the mothers who continued on a poor diet. The babies of the mothers who ate the extra food were stronger and ill less often, and none of the babies was premature. When the pregnant mother's diet is poor, the infant suffers as well as the mother. A good diet before and during pregnancy is considered good health insurance for both the mother and the infant (9).

### **An Adequate Diet**

The regular diets of children in an Illinois school (10) failed to meet the National Research Council's recommended dietary allowances in all nutrients except vitamin A. The diets of these children were made adequate by additional milk and its products, eggs, whole grain cereals, and fruit juice.

Prior to the study, these children had made slow gains in growth. After a year on the improved diet, the growth gains more than doubled those prior to the study.

### **Breakfast**

A breakfast study (11) to learn the effects on school boys of omitting breakfast, showed undesirable attitudes and poor scholastic work. Other breakfast studies (12 and 13) were made with men and women. When they ate breakfasts that supplied at least one-fourth of their daily needs, they could do more work and were more alert mentally than when they skipped breakfast or had only coffee. From these studies, it is evident that breakfast is essential if people are to reach their highest levels of physical and mental work.

### **Enriched Flour and Fortified Margarine**

A study was made of the nutritional status of the people of Newfoundland, Canada (14). Medical examinations of these people showed nutritional deficiencies due to eating food very low in vitamin A, the three B vitamins, thiamine, riboflavin, and niacin, and vitamin C. Upon examination of their food supply, it was found to contain very little of the above vitamins. Nor did the food contain much iron or calcium.

Following this study, steps were taken to improve the nutrition of these people by enriching all the flour they used with the three B vitamins, and by fortifying all the margarine with vitamin A.

Four years later, medical examination of these people showed an improvement in their physical condition that was attributed to the additional vitamin A and the B vitamins. The improvements due to the added vitamins were less inflammation of the mouth and face, and fewer complaints of digestive disturbances and constipation. These people, especially the children, appeared more alert than at the beginning of the study.

### **Enriched Rice**

The enrichment of rice in an experimental zone in the Philippines produced dramatic results (15). In this zone, deaths from beriberi, an illness due to too little thiamine (vitamin B<sub>1</sub>), were reduced by 90 per cent. By contrast, in a similar section of the Philippines where the people ate the usual polished rice, the number of deaths from beriberi increased.

### **Wise Food Selection**

Cornell University students have found that dietary advice can help them with some health problems. Each year the University medical staff finds a number of students who need help in selecting their food. They may be overweight or underweight. They may have diabetes, anemia, allergies, or other conditions that require wise food selection. Under the guidance of a medical nutritionist, these students are taught to choose foods that will help them live more nearly normal lives.



These illustrations show how the right kind or proper amount of food made a difference in the lives of many people. It made a difference because the people had not been eating the food needed for a healthy body. As the knowledge of nutrition accumulates, it is evident that the right kind and amount of food from infancy through adolescence is an important factor in the health and well being of the individual the rest of his life.

Choosing food for family meals is easy because every family member needs the same basic foods. Either of the food guides given on pages 8-9 will be helpful in choosing and planning family meals. Some food from every group should be included in our daily meals because each has a special job to do. Moreover, every one of the groups includes a wide variety from which to choose. Within each, some foods may be less expensive, more abundant, or better liked, but most are similar in food values. For example, when citrus fruits are scarce and expensive, as they usually are during the summer and fall, use tomatoes, raw cabbage, or new potatoes.

The amount of the basic foods that a person will require depends upon his age, activity, and physical condition. Select foods for breakfast, dinner, and lunch or supper so that each meal supplies about one-third of the total needs for the day. That means breakfast too! Meals should be eaten at regular times. Skipping meals or eating in a hurry will hinder good nutrition. And good nutrition is a step toward good health.

### USE OF FOOD

The body needs food to provide:

- energy for work, play, and warmth
- material for growth and replacement of wornout tissue
- material for the regulation of body activities, such as the beating of the heart, the clotting of the blood, and the functioning of the nerves

Some essential nutrients and their uses are given in the table on pages 8-9.

## Energy Food

Energy produced by food is used up by physical activity, such as work and play, and keeping the body warm. The primary sources of energy are foods high in fats, sugars, and starches. These foods are burned in the body in much the same way that gasoline is burned in a car to make it go. The energy produced by these foods is measured in calories. Who hasn't heard of calories! Fats yield about twice as many calories as do sugars and starches. For example, one tablespoon of butter or other fat produces about 100 calories, but it takes two tablespoons of starch or sugar to yield the same.

One's total energy need depends largely upon age, activity, and size. Teenagers who are still growing need more energy food than do adults. For example, a high school or college boy needs more than his father does. The teenage girl also requires plenty of energy food to have that alert, radiant appearance so important to her. An active young homemaker with a family of small children—and how could she be other than active—may need as many as 2300 calories a day.

But as one grows older, one's energy needs decrease. To continue eating as much food then as when younger and more active, may add inches to the waistline. At the first indication of an increase in weight, keep a critical eye on foods that are especially high in fat and sugar. This may mean trimming the fat from meat, substituting baked and broiled foods for fried ones, and eating fewer candies, cakes, and pastries. This kind of eating can add more active, vigorous years to one's life. Why not eat to keep fit!

## Materials for Growth, Repair, and Regulation

Just as a house is built and repaired with certain kinds of building materials, so the human body is built and repaired with certain kinds of food materials. Not lumber, cement, and bricks, but proteins, minerals, and vitamins are necessary to build the body.

### PROTEIN

Protein, a vital building material found in animal foods, some vegetables, and cereals is essential for growth and the maintenance of body tissues. Protein from animal sources and from legumes has a higher nutritive value than the protein found in other vegetables and cereals. This difference is due to the composition of the proteins in these foods.

Proteins are made up of chemical substances known as amino acids. In the words of a well known nutritionist\* "Amino acids form the alphabet of the proteins. They have the same relation to proteins that letters have to words. At least 22 different letters make up the amino acid alphabet, and combinations of the same or different amino acids make a great variety of proteins . . . The amino acids in a protein determine its chemical characteristics and its nutritive value and how it functions in the metabolism of the body" (16).

\* Ruth M. Leverton

Of the 22 amino acids, 8 are dietary essentials. Complete proteins are those which contain significant amounts of these 8 essential amino acids. Foods containing complete proteins are meat, fish, poultry, milk, and cheese. Legumes such as common varieties of beans and soybeans contain proteins almost as good as those from animal sources; the nutritive value of proteins from fruits, vegetables, grains, and nuts is still lower, because the variety of amino acids is fewer.

Some animal sources of protein should be included in the daily meals. A serving of meat, an egg, and two or more cups of milk will supply a large portion of the daily protein need for an adult; vegetables and cereals will provide the balance. The nutritive value of the protein of breakfast cereal is improved when served with milk.

*Extra protein needs.* Children need extra protein because they are growing; it takes a good supply of high quality protein to build strong healthy bodies.

Pregnant and nursing mothers need more protein than they do before pregnancy. To meet this requirement, it is recommended (17) that a pregnant woman include in her meals daily a quart of milk and two servings of meat or other high protein food. The nursing mother should have daily,  $1\frac{1}{2}$  quarts of milk as well as the additional serving of meat or high protein food.

## TWO SIMILAR DAILY FOOD

FOOD FOR FITNESS GUIDE Food Groups	Number of servings daily	BASIC SEVEN FOOD GROUP Food Groups
Vegetable-fruit group: Dark-green or deep-yellow vegetables	Four or more	Green and yellow vegetables
Citrus fruit or other fruit or vegetable important for vitamin C		Tomatoes, citrus fruit, raw cabbage
Other fruits and vegetables, including potatoes		Potatoes, other vegetables, and
Milk group (cheese and ice cream can replace part of the milk)	Two cups or more	Milk, cheese, ice cream
Meat, poultry, fish, eggs, dried beans, nuts	Two or more	Meat, poultry, fish, dried beans, Eggs
Bread-cereal group— whole grain or enriched	Four or more	Bread, flour, cereals— whole grain or enriched
Because fat occurs naturally in many foods, a certain amount will be provided by the foods stressed in the above plan.		Butter, fortified margarine

\* x = moderate amount; xx = large amount.

## MINERALS

Minerals may well be called the foundation and framework materials for the human body. Built with all the necessary minerals, a body becomes well-shaped and strong. A dozen or more minerals are in the body structure. Those that are frequently low in the meals of many Americans are calcium, iron, and iodine.

### Calcium

Calcium in combination with phosphorus, protein, and vitamin D makes for rigidity of the bones and thus contributes to good posture. Calcium is also needed for teeth, the clotting of the blood, the normal action of the muscles, and for the functioning of certain enzymes. To work well, the body needs calcium daily throughout life. When food does not provide the calcium needed for the proper functioning of the body, calcium is removed from the teeth or bones. Phosphorus is generally abundant in our foods and its deficiency is not common.

Milk is our best source of calcium. Unless milk or cheese is included in our meals each day, it is doubtful whether the average American can get enough calcium to supply recommended amounts. Because children are growing, their need for calcium is greater than is that of the adult man or woman. Daily recommended amounts of milk are: children, three to four cups; teenagers, at least 4 cups; adults, two or more cups; the pregnant woman, one quart; the

## GUIDES IN CURRENT USE

	Number of servings daily	Nutrients	For energy	For growth and repair	For regulation
	One or more	Vitamin A in all; iron in dark-green vegetables		x*	x
	One or more	Vitamin C		x	x
uits	Two or more	Varying amounts of several nutrients	x	x	x
	Two cups or more	Calcium, protein, vitamin A, riboflavin (B <sub>2</sub> )	x	xx	xx
uts	One One	Protein, iron, B vitamins	x	xx	x
	Some daily	Starch, protein, iron, B vitamins	xx	x	x
	Some daily	Fat, vitamin A	xx	x	

nursing mother, one and one-half quarts. The easiest way to get your daily milk quota is to drink most of it. The balance can be eaten as soup, cheese, or pudding.

*Calcium in the atomic age.* Radioactive strontium 90, a product of atomic explosions, is mentioned currently as a potential health problem. It is pointed out in the Yearbook of Agriculture (18) that

"Calcium appears to have an added function in the atomic age. It may reduce the amount of radioactive strontium 90 that may be deposited in the body . . . . Animals in one experiment were fed diets high in calcium, and they deposited less radioactive strontium than those that had diets low in calcium. Rats fed 2 per cent of calcium (high level) in their ration for 38 days and then given small amounts of radioactive strontium for 7 days retained only about one-fourth as much of the strontium as rats that had rations with 0.5 per cent calcium (low level). The same kind of results was obtained with cows.

"If people react in the same way, it will be important to have high intakes and body reserves of calcium as built-in protection against radioactivity."

### Iron

All the iron in your body would make only one small nail, but this small amount is essential for hemoglobin formation. You may be anemic if your diet is low in iron-rich foods.

Adolescence is a period in the child's life when much iron is needed. At this time, the body must manufacture more blood to supply the rapidly growing body. Teenage girls not only need a larger blood supply to meet their rapid growth demands, but also to replace blood lost during menstruation.

Another time in life when the iron need of the body is increased is during motherhood. The pregnant woman should give special attention to choosing foods rich in iron and high in protein to maintain the best quality blood. If she keeps her blood quality high, the baby will have stored in its body the iron it will need during the first few months of life. While the mother is nursing the baby, the iron content of her meal should be high.

It is easy to choose foods that provide enough iron. Iron is supplied by meats, beans, eggs, leafy green vegetables, and whole grain and enriched cereals.

### Iodine

Another mineral needed for good physical and mental health is iodine. The activity of the thyroid gland depends on iodine. The thyroid gland regulates the rate of burning of the food in the body, just as the carburetor regulates the rate of burning of gasoline in an automobile. The lack of iodine in your food may cause simple goiter; in children it may also retard growth.

The need for iodine, like that for iron and calcium, is increased especially during adolescence and pregnancy.

Using iodized salt is an easy way to get iodine in the family meals. Iodized salt is recommended by many physicians and is generally available in modern food stores. A delightful way to get iodine is to serve sea foods, such as salmon, oysters, codfish, haddock, or others, at least once a week.



## VITAMINS

Vitamins serve both as body-building and body-regulating materials. Scientists have found that some of the vitamins are essential for the growth and health of human beings. Vitamins discussed here are A, C (ascorbic acid), D, and three of the B group—thiamine (B<sub>1</sub>), riboflavin (B<sub>2</sub>), and niacin.

### Vitamin A

Vitamin A is needed for growth, for normal vision in the dark, and for healthy skin and mucous membranes. When these membranes are healthy, microbes find it more difficult to enter the body. Vitamin A is a "must" for eyes to see at night; without it, night blindness may develop. No one who has night blindness should drive a car or pilot a plane.

Vitamin A occurs as such in whole milk, butter, eggs, liver, kidney, and some fish. Carotene, a pigment in dark-green and yellow vegetables can be converted to vitamin A by the body. For practical purposes we talk about the vitamin A value of vegetables.

You can count on this vitamin being in your green and yellow vegetables if they are fresh when you cook, can, or freeze them. Unlike some of the vitamins, A is not destroyed during cooking. But if vegetables are allowed to wilt, some of the vitamin A is lost.

### Vitamin C (ascorbic acid)

Vitamin C is as fickle and unstable as vitamin A is steady and dependable; but vitamin C is just as important to good health. It is needed for healthy gums, and strong blood vessels, and it hastens the healing of wounds.

Excellent food sources of vitamin C are citrus fruits, strawberries, cantaloup, tomatoes, the cabbage family, and new potatoes. Many other fruits and vegetables contain enough vitamin C to be worth counting. To get as much vitamin C as you can from the vegetables, make certain they are fresh whether used immediately or preserved by canning or freezing.

#### **B vitamins**

The B vitamins are a large family. Thiamine ( $B_1$ ), riboflavin ( $B_2$ ), and niacin are needed by all of us.

Thiamine ( $B_1$ ) helps to maintain muscle tone and plays an important role in the body's use of sugar and starch, thus helping to keep the nervous system healthy. Like other vitamins, it too is needed for growth.

Thiamine is found in many foods but is abundant in only a few: Lean pork is one of the best sources. Legumes, some variety meats, and whole grain cereals contain worthwhile amounts of thiamine ( $B_1$ ). In the milling of wheat for flour, this vitamin along with the other vitamins and minerals is removed. So that people may get some of these important nutrients in bread and flour, a New York State law requires millers to add the three B vitamins—thiamine, riboflavin, and niacin—and the mineral iron to all family flour. The baker adds these nutrients to the bread if he uses flour that is not enriched.

Riboflavin ( $B_2$ ) is another B vitamin needed for growth and general well-being. This vitamin is found in milk, meat, eggs, cereals, and leafy green vegetables. Milk is an especially good source of this vitamin. Riboflavin is destroyed by light. Milk (19) left for an hour or two on the doorstep or window sill in bright light loses much of its riboflavin.

Niacin is another of the B vitamins needed for good physical and mental health. It helps to prevent skin disorders and nervous disturbances. Many common foods, especially meats, contain this vitamin in significant amounts.

#### **Vitamin D**

Vitamin D is needed for the growth of bones and teeth. This vitamin promotes the absorption of calcium. Bowlegs, bulging foreheads, and other bone deformities caused by faulty calcification may be due to a lack of this vitamin during the growing period.

Small amounts of vitamin D are found in eggs, herring, sardines, tuna, and salmon. Direct sunshine causes this vitamin to be formed within the body. Vitamin D can be obtained from fortified milk or from a pharmaceutical preparation prescribed by the family physician. Vitamin D is needed from infancy through adolescence, and during pregnancy and lactation.

Illustrations have shown that the appropriate kinds and amounts of food were important factors in the health and well-being of many people. Suitable kinds of food supply the essential nutrients—protein, minerals, vitamins, and energy materials. These essential nutrients can be obtained by selecting food daily from each of the following groups:

- milk and milk products
- meat, fish, poultry, dried legumes, and nuts
- fruits and vegetables:
  - leafy green and yellow vegetables; citrus fruits, tomatoes, raw cabbage, strawberries, and cantaloup; potatoes and other vegetables and fruits
- cereals, whole grain or enriched



## REFERENCES

1. Pett, L. Bradley. 1953. Values from tripling the milk used in an institution. *Federation Proceedings* 12:426.
2. Roberts, L. J., Blair, R., Lenning, B., and Scott, M. 1938. Effect of a milk supplement on the physical status of institutional children: I. Growth in height and weight. *American Journal Diseases of Children* 56: 287-300.
3. MacNair, V., and Roberts, L. J. 1938. Effect of a milk supplement on the physical status of institutional children: II. Ossification of the bones of the wrist. *American Journal Diseases of Children* 56: 494-509.
4. Leverton, Ruth M., McMillian, Thelma J., and Peters, Matilda. 1944. Blood regeneration in women blood donors. *Journal American Dietetic Association* 20: 747-751.
5. Orr, J. B., and Gilks, J. L. 1931. Studies of nutrition. The physique and health of two African tribes. Medical Research Council. Special Report Series 155, 82 pages.
6. Crawford, J. A. 1939. The work at the Recruits' Physical Development Depot, Canterbury: The undersized recruit. *Journal of the Royal Army Medical Corps* 73:1. (Abstract in *Bulletin of National Research Council* 109:38. 1943.)
7. Ebbs, J. H., Tisdall, F. F., and Scott, W. A. 1941. The influence of pre-natal diet on the mother and child. *Journal of Nutrition* 22:515-526.
8. Burke, Bertha A. 1945. Nutrition and its relationship to the complications of pregnancy and the survival of the infant. *American Journal of Public Health* 35:334-339.
9. Toverud, K. U., Stearns, G., and Macy, I. G. 1950. Maternal nutrition and child health, an interpretative review. *National Research Council Bulletin* 123.
10. Roberts, L. J., Blair, R., Greider, M., Oldham, H., and Young, M. 1945. Results of providing a liberally adequate diet to children in an institution. *Journal Pediatrics* 27:393, 410, 418.

11. Tuttle, W. W., Daum, K., Larsen, R., Salzano, J., and Roloff, L. 1954. Effect on school boys of omitting breakfast: Physiologic responses, attitudes, and scholastic attainments. *Journal American Dietetic Association* 30:674-677.
12. Tuttle, W. W., Wilson, M., and Daum, K. 1949. Effect of altered breakfast habits on physiologic response. *Journal of Applied Physiology* 8:545-558.
13. Daum, K., Tuttle, W. W., Martin, C., and Myers, L. 1950. Effect of various types of breakfasts on physiologic response. *Journal of American Dietetic Association* 26:503-509.
14. 1945. Medical Survey of Nutrition in Newfoundland. *The Canadian Medical Association Journal* 52:227-250. 1949. Medical Resurvey of Nutrition in Newfoundland. *The Canadian Medical Association Journal* 60:1-24.
15. Report of Field Trials in Bataan, Philippines. 1950. Artificial enrichment of white rice as a solution to endemic beriberi. *Journal of Nutrition* 42:501-523.
16. Leverton, R. M. Amino acids. 1959. Food—Yearbook of Agriculture, United States Department of Agriculture, pp. 64-73.
17. Recommended daily dietary allowances for expectant and nursing mothers. 1958. National Research Council, National Academy of Sciences.
18. Hathaway, M.L., and Leverton, R. M. Calcium and phosphorus. 1959. Food—Yearbook of Agriculture, United States Department of Agriculture, pp. 112-118.
19. Peterson, W. J., Haig, F. M., and Shaw, A. O. 1944. The destruction of riboflavin in milk by light. *Journal American Chemical Society* 66:662. (Abstract in *Nutrition Reviews* 3:126.)

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